

=> d his

(FILE 'HOME' ENTERED AT 13:28:26 ON 08 NOV 2002)

FILE 'STNGUIDE' ENTERED AT 13:28:38 ON 08 NOV 2002

FILE 'HOME' ENTERED AT 13:28:58 ON 08 NOV 2002

FILE 'STNGUIDE' ENTERED AT 13:29:07 ON 08 NOV 2002

ACT ALKBATT/Q

L1 QUE ABB=ON PLU=ON (X21-B? OR X16-X? OR X16-E OR N07-LO3A OR
L2 QUE ABB=ON PLU=ON (H01M-004?)/IC
L3 QUE ABB=ON PLU=ON 429050000-429255000/NCL
L4 QUE ABB=ON PLU=ON L1 OR L2 OR L3

FILE 'CAPLUS, WPIDS, INSPEC, ENERGY, JAPIO, USPATFULL' ENTERED AT
13:33:46 ON 08 NOV 2002

SET HIGHLIGHT OFF

SET HIGHLIGHT ON

=> s (lithium titanate)

L5 1014 (LITHIUM TITANATE)

=> s (lithium a titanate)

3 FILES SEARCHED...

L6 107 (LITHIUM A TITANATE)

=> s l6 and l4

'MC' IS NOT A VALID FIELD CODE

X16-E ELECTRODES

A12-E06 BATTERIES, ACCUMULATORS, FUEL CELLS

'NCL' IS NOT A VALID FIELD CODE

'MC' IS NOT A VALID FIELD CODE

'IC' IS NOT A VALID FIELD CODE

'NCL' IS NOT A VALID FIELD CODE

'MC' IS NOT A VALID FIELD CODE

'NCL' IS NOT A VALID FIELD CODE

'MC' IS NOT A VALID FIELD CODE

'NCL' IS NOT A VALID FIELD CODE

'MC' IS NOT A VALID FIELD CODE

L7 39 L6 AND L4

=> s l7 and nano?

L8 2 L7 AND NANO?

=> display

ENTER (L8), L# OR ?..

ENTER ANSWER NUMBER OR RANGE (1):1-2

ENTER DISPLAY FORMAT (STD):full

L8 ANSWER 1 OF 2 WPIDS (C) 2002 THOMSON DERWENT

AN 2002-618937 [66] WPIDS

DNN N2002-490085 DNC C2002-174702

TI Synthesis of particulate zero-strain lithium titanate

intercalation compound for re-chargeable energy storage systems, involves

annealing homogeneous precursor mixture and rapid cooling synthesized

particles.
DC L03 X16
IN AMATUCCI, G G
PA (AMAT-I) AMATUCCI G G
CYC 1
PI US 2002102205 A1 20020801 (200266)* 13p H01M004-48 <--
ADT US 2002102205 A1 US 2001-771809 20010129
PRAI US 2001-771809 20010129
IC ICM H01M004-48
AB US2002102205 A UPAB: 20021014

NOVELTY - A homogeneous precursor mixture (HM) comprising nanostructure titania and thermolabile source(s) of lithium ions, is heated rapidly to an annealing temperature of 750-800 deg. C and is held for a time required to effect maximum available reaction of HM, to synthesize intercalation compound particles (IP). IP is cooled rapidly to a temperature below the reaction temperature, so as to prevent further growth of IP.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are included for the following:

(1) Particulate lithium titanate intercalation compound; and

(2) Rechargeable electrochemical cell.

USE - For re-chargeable energy storage systems (claimed).

ADVANTAGE - The electrochemical cells using the zero-strain nanostructure lithium titanate, exhibit high specific energy storage capacity at high recharge rates.

DESCRIPTION OF DRAWING(S) - The figure shows the cross-sectional view of an electrochemical cell fabricated with nanostructure lithium titanate intercalation compound.

Dwg.3/10

FS CPI EPI

FA AB; GI

MC CPI: L03-E01B5B

EPI: X16-B01F1; X16-E01C1; X16-E01G

L8 ANSWER 2 OF 2 WPIDS (C) 2002 THOMSON DERWENT

AN 2001-514217 [56] WPIDS

DNN N2001-380989 DNC C2001-153565

TI Paste for film or laminate used in rechargeable battery comprises heterogeneous mixture of organic polymer or precursor matrix, insoluble inorganic solid, and material increasing electrolyte transport and storage.

DC A14 A25 A85 L03 U14 X16

IN BIRKE, P; SALAM, F

PA (FRAU) FRAUNHOFER GES FOERDERUNG ANGEWANDTEN; (FRAU) FRAUNHOFER GES FOERDERUNG ANGEWANDTEN FO

CYC 95

PI WO 2001041246 A1 20010607 (200156)* DE 42p H01M010-40

RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC MW MZ

NL OA PT SD SE SL SZ TZ UG ZW

W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CR CU CZ DE DK DM

DZ EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC

LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ PL PT RO RU SD SE

SG SI SK SL TJ TM TR TT TZ UA UG US UZ VN YU ZA ZW

DE 19957285 A1 20010621 (200156) H01M004-62 <--

AU 2001011405 A 20010612 (200159) H01M010-40

BR 2000015957 A 20020806 (200260) H01M010-40

EP 1236239 A1 20020904 (200266) DE H01M010-40

R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT

RO SE SI

ADT WO 2001041246 A1 WO 2000-EP10270 20001018; DE 19957285 A1 DE 1999-19957285 19991129; AU 2001011405 A AU 2001-11405 20001018; BR 2000015957 A BR

2000-15957 20001018, WO 2000-EP10270 20001018; EP 1236239 A1 EP
2000-972802 20001018, WO 2000-EP10270 20001018
FDT AU 2001011405 A Based on WO 200141246; BR 2000015957 A Based on WO
200141246; EP 1236239 A1 Based on WO 200141246
PRAI DE 1999-19957285 19991129
IC ICM H01M004-62; H01M010-40
ICS H01M004-02; H01M006-46
AB WO 200141246 A UPAB: 20011001

NOVELTY - A paste is a heterogeneous mixture of a matrix (A) comprising organic polymer(s) or their precursor(s) or prepolymer(s), an inorganic solid (B), which is insoluble in the matrix and water and can be activated electrochemically, and a material (C), which improves electrolyte fluid transport and storage in the device but does not simultaneously improve the conductivity if (B) is a material suitable as electrode material.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for the following:

(a) self-supporting or supported films comprising a heterogeneous mixture of (A), (B) and (C);

(b) film laminates;

(c) thick-film rechargeable electrochemical cells comprising the laminate;

(d) the production of flexible and self-supporting or supported films, laminates and electrochemical devices; and

(e) the use of material (C) in pastes containing (A) and (B) and the self-supporting and supported films.

USE - The films are useful for making electrochemical devices, especially accumulators and batteries in the form of thin film laminates, including compact accumulators and accumulators in substrates for solar cells; and in thick-film technology, e.g. for back-up chips.

ADVANTAGE - Using the paste avoids the drawbacks associated with the use of homogeneous constituents, i.e. materials capable of electrochemical activation that are soluble in the polymer or electrochemically active film composites with a high degree of porosity.

Dwg.0/2

TECH WO 200141246 A1UPTX: 20011001

TECHNOLOGY FOCUS - INORGANIC CHEMISTRY - Preferred Composition: The paste contains 0.05-50, preferably 2-10 wt.% material (C), for improving electrolyte transport and storage. If the solid (B) is an electrode material, it may also contain an additive (D) to increase the conductivity, preferably 2.5-35 wt.% (D) with respect to (B).

Preferred Components: The solid (B) is a substance suitable for use as positive or negative electrode material, solid state electrolyte or ionic or electronic conductor between 2 adjacent substances in the device. The material (C) is selected from pumice powder, zeolites, carbon nanotubes, chamotte, silica gel, acetylene black, activated carbon, lamp black, carbon black, carbon of high specific surface area and/or conductivity, fumed silica or kieselguhr. Suitable additives (D) are carbon black and/or graphite, metals and nitrides.

Preferred Cells: Inorganic solid (B) is: (a) a positive electrode material selected from lithium cobalt oxide, lithium nickel oxide and/or nickel manganese oxide or a multinary compound and/or substance substituted with magnesium, aluminum or fluorine; (b) an electrolyte material selected from natural lithium salt and minerals, preferably spodumene, beta-eucryptite and petalite, and synthetic lithium salts, preferably containing other cations or main- and sub-group elements; and/or (c) a negative electrode material selected from any modification of carbon, titanium dioxide, titanium disulfide, tungsten dioxide, molybdenum dioxide, lithium titanate, a metal forming alloys with lithium, semiconductor material, oxides, iodides, sulfides, nitrides or heterogeneous mixtures of these.

TECHNOLOGY FOCUS - ORGANIC CHEMISTRY - Preferred Plasticizers: Suitable

plasticizers used in the matrix (A) are dimethyl sulfoxide; dimethyl, ethyl methyl, diethyl, methyl propyl, ethylene and propylene carbonate; ethylene sulfite; dioxolane; tetrahydrofuran; gamma-butyrolactone; and mixtures of these.

TECHNOLOGY FOCUS - POLYMERS - Preferred Matrix: The matrix consists of natural and/or synthetic polymer(s), preferably a swellable and/or chlorinated or fluorinated polymer, especially polyvinylidene chloride, polyethylene oxide, a polyvinylidene fluoride-hexafluoropropylene copolymer or a mixture containing at least one of these polymers.

Preferred Composition: The paste contains 0.05-50, preferably 2-30 wt.% organic polymer. The matrix (A) also contains a plasticizer, preferably in an amount of 0.005-50, especially 5-12, more especially at most 10 wt.% with respect to material (B); and/or a solvent or swelling agent for the polymer, precursor or prepolymer.

Preferred Films: The self-supporting or supported film is a flexible film. The film may contain a dissolved electrolyte, which is introduced into the film by dissolution of a plasticizer on the basis of a plasticizer concentration gradient. **Laminate:** The laminate has (1) a layer in which (B) is a positive electrode material, (2) a layer in which (B) is a negative electrode material and/or (3) a layer in which (B) has solid state electrolyte properties.

Preferred Laminate: The laminate also has a layer with positive electrode material as lower drain electrode and a layer with negative electrode material as upper drain electrode. There may also be a thin plastics film containing conducting, metallic or alloy elements for electron transport, between the lower and/or upper drain electrodes and the layer with positive or negative electrode material. In laminates with layers (1), (2) and (3), at least layer (2) also contains a dissolved electrolyte and material (C) may also be a material increasing the conductivity if (B) is suitable as electrode material. After lamination, the laminate is contacted with another swelling agent, preferably propylene carbonate, and then sealed in a suitable material or housing.

Preferred Production: (claimed) The flexible film is produced by spraying a film of the paste on a support and drying, preferably in vacuo down to about 10-2 mbar and between ambient temperature and 150 degrees C, especially at 65-80 degrees C, or at ambient pressure and up to 200 degrees C, preferably at about 120 degrees C. The self-supporting film is produced by making a film from the paste, drying, contacting the dried film with a dissolved solid electrolyte, so that it penetrates the film, and then drying between room temperature and about 70-90 degrees C. A self-supporting or supported film suitable as electrolyte layer in electrochemical devices is produced by (a) making a film by solidifying the paste; and (b) impregnating the film, containing no or little plasticizer, with a solution of a suitable electrolyte in a plasticizer, so that it passed into the layer or laminate (partly) as a result of the plasticizer concentration gradient in the film. The laminate is produced by making individual films from pastes and laminating these.

Electrochemical devices are produced by making self-supporting or supported films from the pastes, laminating the films to a laminate suitable for electrochemical activation and impregnation with a solution of electrolyte in plasticizer as in step (b) above. **Preferred Production:**

The laminate is contacted with a dissolved solid electrolyte, so that it penetrates the laminate, and then drying between room temperature and about 70-90 degrees C.

FS CPI EPI

FA AB

MC CPI: A08-M09A; A09-A03; A12-E06; L03-E; L03-E05B

EPI: U14-H02; X16-E08A; X16-E09

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L2 QUE ABB=ON PLU=ON (H01M-004?)/IC
L3 QUE ABB=ON PLU=ON 429050000-429255000/NCL
L4 QUE ABB=ON PLU=ON L1 OR L2 OR L3

FILE 'CAPLUS, WPIDS, INSPEC, ENERGY, JAPIO, USPATFULL' ENTERED AT
13:33:46 ON 08 NOV 2002

SET HIGHLIGHT OFF

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L5 1014 S (LITHIUM TITANATE)
L6 107 S (LITHIUM A TITANATE)
L7 39 S L6 AND L4
L8 2 S L7 AND NANO?

=> s l7 and submicro?

L9 0 L7 AND SUBMICRO?

=> s lithium a titanium

3 FILES SEARCHED...

L10 317 LITHIUM A TITANIUM

=> s l10 and l4

'MC' IS NOT A VALID FIELD CODE

X16-E ELECTRODES

A12-E06 BATTERIES, ACCUMULATORS, FUEL CELLS

'NCL' IS NOT A VALID FIELD CODE

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'MC' IS NOT A VALID FIELD CODE

'NCL' IS NOT A VALID FIELD CODE

'MC' IS NOT A VALID FIELD CODE

L11 66 L10 AND L4

=> s l11 and (submicro? or nano?)

L12 3 L11 AND (SUBMICRO? OR NANO?)

=> display

ENTER (L12), L# OR ?..

ENTER ANSWER NUMBER OR RANGE (1):1-

ENTER DISPLAY FORMAT (STD):full

YOU HAVE REQUESTED DATA FROM 3 ANSWERS - CONTINUE? Y/(N):y

L12 ANSWER 1 OF 3 WPIDS (C) 2002 THOMSON DERWENT

AN 2002-521552 [56] WPIDS

DNN N2002-412693 DNC C2002-147748

TI Electrochemical cell for electrochemical devices, comprises electrode
composed of electrode active material, curable organic binder and
electrical conduction unit operatively associated with electrode active
material.

DC A85 L03 P53 X16
 IN SUGNAUX, F; SUGNAUX, F R
 PA (SUGN-N) SUGNAUX CONSULTING; (XOLI-N) XOLIOX SA
 CYC 100
 PI EP 1207572 A1 20020522 (200256)* EN 32p H01M004-04 <--
 R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT
 RO SE SI TR
 WO 2002041417 A1 20020523 (200256) EN H01M004-04 <--
 RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC MW MZ
 NL OA PT SD SE SL SZ TR TZ UG ZM ZW
 W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU CZ DE DK
 DM DZ EC EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR
 KZ LC LK LR LS LT LU LV MA MD MK MN MW MX MZ NO NZ OM PH PL PT
 RO RU SD SE SG SI SK SL TJ TM TR TT TZ UA UG US UZ VN YU ZA ZW
 AU 2002024859 A 20020527 (200261) H01M004-04 <--
 ADT EP 1207572 A1 EP 2000-811081 20001115; WO 2002041417 A1 WO 2001-EP13397
 20011115; AU 2002024859 A AU 2002-24859 20011115
 FDT AU 2002024859 A Based on WO 200241417
 PRAI EP 2000-811081 20001115
 IC ICM H01M004-04
 ICS B22F001-00; C01B013-14; C01G023-00; C01G033-00; H01M004-48;
 H01M004-58; H01M004-62; H01M004-86
 AB EP 1207572 A UPAB: 20020903

NOVELTY - The electrochemical cell comprises an electrode composed of a first electrode active material, a curable organic binder (49) and an electrical conduction unit operatively associated with the electrode active material. The electrode active material possesses a bimodal pore size distribution of which at least one size is mesoporous, and is converted from agglomerated nanoparticles, thermally.

DETAILED DESCRIPTION - The electrochemical cell comprises an electrode which is composed at least of a first electrode active material, a curable organic binder and an electrical conduction unit operatively associated with the electrode active material. The electrode active material possesses a bimodal pore size distribution of which at least one size is mesoporous, as measured by nitrogen porosimetry using the desorption isotherm. The bimodal mesoporous electrode active material is converted from agglomerated nanoparticles, thermally.

INDEPENDENT CLAIMS are also included for the following:

(1) A method of fabricating mesoporous sheet components for use as at least one of an anode, a cathode and a separator in an electrochemical cell. The method involves: (a) providing a first aqueous composition which comprises nanoparticles of a material selected from the anodic electrode active nanoparticles, cathodic electrode active nanoparticles and electrode inactive nanoparticles, (b) drying droplets of the aqueous composition to form discrete agglomerated microparticles (43,44), (c) covering agglomerated particles thermally to form discrete solid bimodal mesoporous microparticles with first average pore radius of 5 nm or less and a second average pore radius differing by at least about 5 nm, as measured by nitrogen porosimetry, (d) providing a second aqueous composition comprising the bimodal mesoporous microparticles and a curable binding material, (e) drying droplets of the second aqueous composition to form a free-flowing powder for discrete porous microparticles coated with a curable binding material, (f) depositing from a dispersed state a layer of the coated microparticles to a desired thickness and (g) bonding the microparticles by polymerizing, cross-linking, heat-setting or curing the binding material to form a mesoporous sheet component for an electrochemical cell with several passageways for an electrolyte; and

(2) A electrochemical device including an electrochemical cell selected from photoelectrochemical cell, electrochromic cell and electrochemical generator. The cell comprises at least an electrode active material, an electrical conduction unit operatively associated with

electrode active material through a linking unit and an ionic conduction unit operatively associated with the electrode active material.

USE - For electrochemical devices with innovative cell designs such as high power battery, solar cells and fast electrochromic devices.

ADVANTAGE - Charging and discharging capacity, cycle characteristics, reliability and safety of the electrochemical cell are excellent.

Electrode formation process is simplified. Handling property of the solid microparticles are improved. A dense porous solid electrode that requires less inactive binder or electron conductive materials, is provided.

Electrochemical devices are manufactured efficiently and economically.

DESCRIPTION OF DRAWING(S) - The figure shows the perspective view of the selecting coating at the surface microparticle with a percolating network of binder and conductive particles.

Conductive particles 48

Binder 49

Microparticles 43, 44

Dwg.4C/10

TECH EP 1207572 A1 UPTX: 20020903

TECHNOLOGY FOCUS - INORGANIC CHEMISTRY - Preferred Cell: The first electrode active material comprises a chalcogenide, hydroxide,

oxyhydroxide oxoacid, oxohydride or thiocyanic acid of non-transition or transition metals, or their lithiated or partially lithiated forms

selected from the elements of group IB, IIA, IIB, IIIA, IVA, IVB, VA, VB, VIB, VIIB and VIII. The electrode active material possesses a bimodal mesoporous form, where the particle has a first average pore radius of 5 nm or less and a second average pore radius differing by at least about 5 nm. The electrochemical cell comprises electrodes including different

electrode active materials connected together by an electrolyte. The microparticles have a specific surface area of 0.01-300 m²/g. Discrete microparticles are coated with a curable organic binder. Mesoporous microparticles are assembled as discrete contacting particles to form a reticulated three dimensional bicontinuous structure. The cell contains an electrically interconnected solid phase material which is in contact with interconnected intra-particle pore space and inter-particle space filled with electrolyte used for ionic transport. Preferred Active

Material: The electrode active material is doped by substitution or solid solution. 0.2-49% of the atoms of the non-transition or transition metal are substituted by another transition or non-transition metals. The electrode potential of the doped electrode active material is shifted by more than 0.05V vs. pristine electrode active material and the fusion point of the doped electrode active material is shifted by more than 10degreesC vs. pristine electrode active material. Electrode active material in a fully lithiated form and doped with a solid solution from 0.2-49% of the atoms of non-transition or transition metal has its lithium partially or totally exchanged for hydrogen to yield an electrode active material represented by formula (I).

where M is at least one element selected from Ti, Zr, Hf; M is at least one element selected from Al, Ga, Zn, Sn, Cu, Si, Ag, In, Ti, Zr, Hf, V, Nb, Ta, Cr, Fe, Mn, Mo and W; and x,y,z and d are respectively a number satisfying conditions: y at least x greater than 0, 0.8 at most y at most 2.6, 1.3 at most z at most 2.2, and 0.02 at most d at most 0.49. Electrode active material is a lithium titanium niobate oxyhydroxide electrochromic material of formula (II).

Lithium titanium niobate oxyhydroxide electrochromic material is used as an electrical energy storage material. Electrode active material comprises a mixture of the doped and pristine forms of same electrode active material, grouped in the same particle, thereby providing microparticles with domains of different fusion points.

Preferred Method: The first aqueous composition comprises an extractable, volatilizable or combustible porosity forming agent selected from ionic or nonionic surfactants, synthetic polymers, alkyl polyethylene oxide, alkyl and aryl polyethylene oxide, and polyethylene oxide-polypropylene

oxide-polyethylene oxide block copolymer molecules, carboxymethyl cellulose, methyl cellulose, hydroxymethyl cellulose, ethylcellulose, phthalates, polyvinyl alcohol, polyacrylic acid, natural polymers, oxidized starch, phosphorylated starch, casein starch and polymers that volatilize below 450degreesC. Curable binding material or the intrinsically conductive polymer is in the form of a latex composition comprising a suspension of polymer particles in water and is added in an amount such as to provide a coating on the microparticles particles of 0.5-10 weight% of latex solids based on the weight of the coated microparticles. Step (e) involves adding to the second aqueous composition a surfactant having a hydrophilic-lipophilic balance value of less than about 13. Step (e) further involves attaching a monolayer of a sensitizing dye or absorbed redox chromophore on the surface of the free-flowing porous microparticles. Step (f) of depositing from a dispersed state further involves coating simultaneously several layers comprising discrete porous microparticles of dissimilar composition selected from electrode and separator layers, short and long wavelength dye-sensitized layers, short and long wavelength redox chromophore layers, small and large pore volume layers, low and high binder loading layers, low and high electronic conductive material loading layers and/or electrically active and barrier layers. Step (f) involves depositing a layer of the coated microparticles onto an electrically conductive substrate. Step (g) involves heating the layer to 100-180degreesC. Step (f) involves depositing a layer of the coated microparticles concentrically onto an elongated electrically conductive member. Nanoparticles are prepared by hydrolyzing an organic metal or metalloid precursor of the anodic electrode active material, cathodic electrode active material or electrode inactive material, or by hydrolyzing a composition containing a mixture of (i) an organic metal or metalloid precursor of the anodic or cathodic active material, and (ii) an organic metal or metalloid precursor of dopant for anodic or cathodic active material.

TECHNOLOGY FOCUS - POLYMERS - Preferred Binder: The curable organic binder is used as a superficial coating of the microparticles in a proportion of 0.5-10 weight% of the microparticles and is composed of a polymeric material with a glass transition temperature of at least 50degreesC selected from polyvinylidene fluoride, polytetrafluoroethylene, fluororubber, polyvinyl polymers such as polyvinylpyrrolidone, polyamides, polyurethanes, ethylene acrylic acid (EM) copolymers and 30 other polymers which are claimed. The binder is blended with conductive materials such as polythiophene, polyphenylene, polypyrrole, polyacetylene, polyisothionaphthene, polyaniline, polyethylenedioxythiophene (PEDOT), poly(phenylenevinylene) or their derivatives, conductive particle (43), graphite/carbon, colloidal metal, doped metal oxide and alloys. The binder is coated selectively at the surface of the microparticles to form a patterned coating comprising elongated members. Microparticles further comprise solid particles selected from acicular particles of the electrode active mass, fine carbon, acicular graphite, acicular graphitized carbon, carbon nanotubes, conductive metallic or doped metal oxide nanoparticle, nanoparticle of a second electrode active material and/or electrically conductive fiber. Discrete microparticles have an spherical or granular shape of diameter 0.05-30 microns. Discrete microparticles comprise a core selected from the non-porous inactive microsphere and porous microsphere composed of a second electrode active material, over which the bimodal mesoporous first electrode active material is coated. Discrete microparticles have a platelet or flaky shape with an aspect ratio greater than 3 and have a size of 0.1-30 microns in their largest dimension.

FS CPI EPI GMPI

FA AB; GI

MC CPI: A11-C02; A12-E09; A12-E14; L03-E01B; L03-E05B; L03-G05C

EPI: X16-E01G

L12 ANSWER 2 OF 3 WPIDS (C) 2002 THOMSON DERWENT

AN 2001-235455 [25] WPIDS

DNN N2001-168350 DNC C2001-070740

TI New lithium insertion-type electrode materials based on orthosilicate derivatives for use in, e.g. electrochemical cells and primary and secondary batteries.

DC A85 L03 V01 X16

IN ARMAND, M; HOVINGTON, P; MICHOT, C; RAVET, N; SIMONEAU, M

PA (CNRS) CENT NAT RECH SCI; (HYDR-N) HYDRO-QUEBEC; (UYMO-N) UNIV MONTREAL

CYC 1

PI CA 2271354 A1 20001110 (200125)* EN 18p H01M004-48 <--

ADT CA 2271354 A1 CA 1999-2271354 19990510

PRAI CA 1999-2271354 19990510

IC ICM H01M004-48

ICS H01M004-50; H01M004-52

AB CA 2271354 A UPAB: 20010508

NOVELTY - Lithium insertion-type electrode materials based on orthosilicate derivatives are new.

DETAILED DESCRIPTION - Lithium insertion-type electrode materials, which are based on orthosilicate derivatives, of formula

$\text{Li}_x\text{M}_m\text{-wDdTiQqRr}(\text{SiO}_4)_1\text{-y}(\text{SO}_4)_s(\text{PO}_4)_p(\text{GeO}_4)_g(\text{VO}_4)_v(\text{AlO}_4)_a(\text{BO}_4)_b$ are new.

M = Mn²⁺ and/or Fe²⁺;

D = a metal having pos. 2 oxidation state, preferably Mg²⁺, Ni²⁺, Co²⁺, Zn²⁺, Cu²⁺, Ti²⁺, V²⁺, or Ca²⁺;

T = a metal having pos. 3 oxidation state, preferably Al³⁺, Ti³⁺, Cr³⁺, Fe³⁺, Mn³⁺, Ga³⁺, Zn³⁺, V³⁺;

Q = a metal having pos. 4 oxidation state, preferably Ti⁴⁺, Ge⁴⁺, Sn⁴⁺, V⁴⁺;

R = a metal having pos. 5 oxidation state, preferably V⁵⁺, Nb⁵⁺, Ta⁵⁺;

s, p, g, v, a, b = respective stoichiometric coefficient for S⁵⁺ (sulfate), P⁵⁺ (phosphate), Ge⁴⁺ (germanate), V⁵⁺ (vanadate), Al³⁺ (aluminate), and B³⁺ (borate) residing in the silicon tetrahedral sites;

d, t, q, r = stoichiometric coefficients, preferably 0-1

M, D, T, Q, R are elements residing in octahedral or tetrahedral sites; w = d + t + q + r; y = p + s + g + v + a + b; d, t, q, r, p, s, v, a, b are all positive, preferably 0-1; 0 at most x at most 2; 1 at most m at most 2; (p + s + v + a + b) is less than 1; and x + 2m + t + 2q + 3r = 4 - p - 2s - v + a + b. INDEPENDENT CLAIMS are also included for (a) an electrical generator having positive electrode(s) containing (I) and negative electrode(s) as a source of lithium ion at a high chemical activity, and (b) a variable optical transmission device constructed from transparent semiconductor coated glass or plastic, and two electrode(s) containing (I) and separated by solid gel electrolytes.

USE - For use as electrode materials for electrochemical cells, and primary and secondary batteries in which the negative electrode is a source of lithium ions. It can also be used in supercapacitors.

ADVANTAGE - The inventive electrode materials can be easily prepared and have capacities of 160 mAh/g in excess of the conventional electrode materials. It is capable of preventing leaching of transition metals into the electrolyte due to the high charge of the orthosilicate anion, which binds selectively the charged cations, including the transition elements.
Dwg.0/0

TECH CA 2271354 A1 UPTX: 20010508

TECHNOLOGY FOCUS - INORGANIC CHEMISTRY - Preferred Material: The negative electrode is a metallic lithium or a lithium alloy, which can be nanodispersed in lithium oxide; a lithium intercalation compound carbon or carbonaceous matters resulting from the pyrolysis of organic derivatives; a lithium-titanium spinel (Li_{1+y}Ti_{2-x/4}O₄), where 0 at most x and 0 at most y at most 1 and its solid solutions with other spinels; and/or a lithium-transition metal mixed nitride. Preferred Components: The positive electrode contains a

conductive additive, preferably carbon. It has an electrode material of formula $\text{Li}_{f+m+s+p} \text{Fe}_f \text{Mn}_m \text{Si}_s \text{P}_p \text{O}_4$, where $(f + m)$ at most 1.2, $s + p = 1$, $0 \leq t$ at most 0.6, and $(8 - 5p - 4s - 2f)$ at least λ at least $(8 - 5p - 4s - 4m - 3f)$. It may also comprise another intercalation material, preferably a lamellar dichalcogenide, a vanadium oxide (VO_x) (where $2.1 \leq t$ at most 2.5), or a Nasicon-related material, e.g. $\text{Li}_3\text{Fe}_2(\text{PO}_4)_3$.

TECHNOLOGY FOCUS - POLYMERS - Preferred Component: The positive electrode may also contain a polymeric binder which can be a homopolymer or a copolymer of tetrafluoroethylene, or an ethylene-propylene-diene terpolymer. **Preferred Binder:** The polymeric binder is preferably polyether, polyester, methylmethacrylate-based polymer, acrylonitrile-based polymer, or vinylidene fluoride-based polymer.

TECHNOLOGY FOCUS - ORGANIC CHEMISTRY - Preferred Component: The positive electrode may also contain an aprotic solvent, preferably ethylene carbonate, propylene carbonate, dimethylcarbonate, diethylcarbonate, methyl-ethylcarbonate, gamma-butyrolactone, tetraalkylsulfamide, and/or dialkyl ether of mono-, di-, tri-, or higher oligo- ethylene glycols with at most 2000 molecular weight.

FS CPI EPI

FA AB

MC CPI: A12-E06A; L03-E01B9

EPI: V01-B01A; X16-A02A; X16-B01F1; X16-E01C1

L12 ANSWER 3 OF 3 WPIDS (C) 2002 THOMSON DERWENT

AN 2000-474884 [41] WPIDS

DNN N2000-354276 DNC C2000-142243

TI New lithium insertion-type electrode material with an orthosilicate structure for use in redox reactions.

DC A85 E19 L03 X16

IN ARMAND, M; HOVINGTON, P; MICHOT, C; RAVET, N; SIMONEAU, M

PA (CNRS) CENT NAT RECH SCI; (HYDR-N) HYDRO-QUEBEC; (UYMO-N) UNIV MONTREAL

CYC 27

PI US 6085015 A 20000704 (200041)* 8p H01M004-48 <--

EP 1134826 A1 20010919 (200155)# EN H01M004-58 <--

R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT

RO SE SI

JP 2001266882 A 20010928 (200172)# 22p H01M004-58 <--

ADT US 6085015 A US 1998-47225 19980325; EP 1134826 A1 EP 2000-420045

20000314; JP 2001266882 A JP 2000-117248 20000314

PRAI CA 1997-2200999 19970325; EP 2000-420045 20000314; JP 2000-117248

20000314

IC ICM H01M004-48; H01M004-58

ICS C01B025-30; C01B033-00; C01B035-00; G01N027-30; G02F001-15;

H01G009-00; H01G009-004; H01G009-058; H01M004-02;

H01M004-62; H01M010-40; H01M014-00

AB US 6085015 A UPAB: 20000831

NOVELTY - A lithium insertion-type electrode material having an orthosilicate structure is new

DETAILED DESCRIPTION - The new lithium insertion-type electrode material has the formula $\text{Li}_x \text{Mm}-(d+t+q+r) \text{Dd} \text{Tt} \text{Qq} \text{Rr} (\text{SiO}_4)_l - (p+s+g+v+a+b) (\text{SO}_4)_s (\text{PO}_4)_p (\text{GeO}_4)_g (\text{VO}_4)_4 (\text{AlO}_4)_a (\text{BO}_4)_b$ (I), where:

M = Fe^{2+} and/or Mn^{2+} ;

D = divalent cations selected from Mg^{2+} , Ni^{2+} , Co^{2+} , Zn^{2+} , Cu^{2+} , Ti^{2+} , V^{2+} and Ca^{2+} ;

T = trivalent cations selected from Al^{3+} , Ti^{3+} , Cr^{3+} , Fe^{3+} , Mn^{3+} , Ga^{3+} , $\text{Zn}^{2+}(\text{sic})$ and V^{3+} ;

Q = tetravalent cations selected from Ge^{4+} , Sn^{4+} , Ti^{4+} and V^{4+} ;

R = pentavalent cations selected from V^{5+} , Nb^{5+} and Ta^{5+} ;

s, p, g, v, a and b = are the stoichiometric coefficients for S^{6+} (sulfate), P^{5+} (phosphate), Ge^{4+} (germanate), V^{5+} (vanadate), Al^{3+}

(aluminate) and B3+ (borate) respectively residing in the silicon tetrahedral sites;

d, t, q, r, p, s, g, v, a and b = 0-1;

x = 0-2;

m = 1-2;

p+s+g+v+a+b = less than 1; and

x+2m+t+2q+3r = 4-p-2s-v+a+b.

An INDEPENDENT CLAIM is included for an electrical generator with one or more anodes made from the material (I) and one or cathodes which are the source of lithium ions at a high chemical activity.

USE - Used as redox materials.

ADVANTAGE - None given.

Dwg.0/0

TECH US 6085015 A UPTX: 20000831

TECHNOLOGY FOCUS - INORGANIC CHEMISTRY - Preferred Structure: The electrode material has a crystal structure related to that of lithium phosphate or lithium orthosilicate. One or more lithium ion can be inserted or extracted per unit formula.

TECHNOLOGY FOCUS - ELECTRICAL POWER AND ENERGY - Preferred Cathode Material: The cathode is preferably made from metallic lithium, a lithium alloy, a nanodispersion of a lithium alloy in lithium oxide, a lithium intercalation compound, carbon, carbonaceous matter resulting from the pyrolysis of an organic derivative, a lithium-titanium spinel $\text{Li}_{1+y}\text{Ti}_{2-x}\text{O}_4$ or solid solutions of the lithium-titanium spinel with other spinels and/or a lithium-transition metal mixed nitride.

x, y = 0-1.

Preferred Composition: The electrical generator features an optionally cross-linked polyether binder containing a dissolved salt which partially includes Li^+ . The aprotic solvent used in the electrical generator is selected from ethylene carbonate, propylene carbonate, dimethyl carbonate, diethyl carbonate, methyl ethyl carbonate, gamma-butyrolactone, a tetraalkylsulfamide, a dialkyl ether of a mono, di, tri, tetra or higher oligo-ethylene glycol with a molecular weight of 2000 or less.

FS CPI EPI

FA AB; DCN

MC CPI: A12-E06A; A12-E14; E31-Q07; E35; L03-E01B5

EPI: X16-E01C1

=> FIL STNGUIDE

COST IN U.S. DOLLARS

	SINCE FILE	TOTAL
ENTRY	SESSION	

FULL ESTIMATED COST

172.94	173.90
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FILE 'STNGUIDE' ENTERED AT 13:52:09 ON 08 NOV 2002

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FILE CONTAINS CURRENT INFORMATION.

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